REMARKS

I. Introduction

In response to the Office Action dated July 13, 2005, claims 6, 7, 16, 17, 26, and 27 have been amended. Claims 1-31 remain in the application, claims 1-5, 12-15, 21-25 have been withdrawn, claims 6-11, 16-20, 26-31 remain under consideration. Re-examination and re-consideration of the application, as amended, is requested.

II. Election/Restriction

In response to the prior Restriction Requirement, Applicants elected species II – claims 6-11, 16-20 and 26-31. The current Office Action states that applicant did not distinctly and specifically point out the supposed errors in the restriction requirement and therefore treated the election as an election without traverse.

Applicants respectfully disagree and traverse the above assertions. On page 7 of the prior Office Action, Applicants submitted the arguments below which are reasserted herein as a traversal of the restriction requirement.

Applicants dispute the assertion by the Office that the two (2) claim Groups involve separate and distinct inventions.

35 U.S.C. §121 provides that "If two or more independent and distinct inventions are claimed in one application, the Commissioner may require the application to be restricted to one of the inventions." The Examiner does not assert that the inventions of the two (2) claim Groups are independent. Rather, the Examiner alleges that the inventions of the two (2) claim Groups are distinct because they are directed to spatial light modulators for steering the reference beams and to MEMs mirrors for steering the reference beams. Applicants assert that restriction is improper because both claim species are directed towards steering the reference beam. The claim differences relate to the use of spatial light modulators or MEMs mirrors. Accordingly, the generic claim addresses the steering of the reference beam with the species directed towards the mechanisms used to steer the reference beam.

Applicants further urge the Examiner take into consideration that the subject matter of each of the claim Groups is linked by the common inventive concept relating to steering a reference beam.

According to M.P.E.P. §803, there are two criteria for a proper restriction requirement. First, the two inventions must be independent and distinct. In addition, there must be a serious burden on the Examiner if restriction is not required. Even if the first criterion has been met in the present case, which it has not, the second criterion has not been met. Applicants assert that a search into prior art with regard to the invention of the different Groups is so related that separate significant search efforts should not be necessary. In this regard, both searches would involve techniques relating to steering a reference beam, a limitation set forth in both claims. Accordingly, there is no serious burden on the Examiner to collectively examine the different claim Groups of the subject application. Therefore, restriction is not proper under M.P.E.P. §803.

In view of the above, specific and distinct details were specified in the election requirement. Accordingly, Applicants traverse the restriction requirement and respectfully request withdrawal of the requirement.

III. Non-Art Rejections

On page (1) of the Office Action, claims 7, 17, and 27 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Namely, the action submits that c-axis was not defined in the claims.

Applicants submit that a c-axis with respect to crystals is not necessary to define since it is well-known in the art. In this regard, a search on Google™ for c-axis and crystals comes up with numerous results that identify a c-axis. To further particularly point out and distinctly claim the subject matter, the claims have been amended such that the c-axis is for a photorefractive crystal. In view of the above, Applicants submit that the rejection is now moot.

IV. Prior Art Rejections

On pages (1)-(2) of the Office Action, claims 6-11, 16-20, and 26-31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yamaji et al., U.S. Patent No. 6,088,321 (Yamaji) in view of Gladney et al., U.S. Publication No. 2004/0090899 (Gladney).

Specifically, the independent claims were rejected as follows:

> Regarding claims 6, 7, 8, 10, 16, 17, 19, 26, 27, 28, and 30, Yamaji discloses a holographic memory system comprising: (a) a photorefractive crystal (10 of Fig. 10) configured to store holograms; (b) a single laser diode (1 of Fig. 10) configured to emit a collimated laser beam to both

write to and read from the photorefractive crystal; and (c) one or more mirrors configured to steer a reference beam (5 of Fig. 10), split from the collimated laser beam, at high speed to the photorefractive crystal. Yamaji does not teach the mirror being MEMS.

However, Gladney teaches such a mirror for scanning the reference beam (see Fig. 9)..

It would have been obvious, at the time the invention was made, to a person having ordinary skill in the art to utilize the mirror of Gladney in the invention of Yamaji since the MEMS mirror is efficient compact and consumes low power.

Applicants traverse the above rejections. Namely, neither Yamaji nor Gladney teach, disclose or suggest the use of a MEMS mirror to steer a 2D plane wave reference beam to a photorefractive crystal.

Independent claims 6, 16, and 26 are generally directed to a holographic memory system. More specifically, a photorefractive crystal is configured to store holograms. Further, a single laser diode is configured to emit a 2D plane wave collimated laser beam to both write to and read from the crystal. The collimated laser beam is split and produces a 2D plane wave reference beam. MEMS mirrors are then used to steer the 2D reference beam to the crystal to read or write an entire page of data.

The cited references do not teach nor suggest these various elements of Applicants' independent claims.

Applicants first note that the 2D plane wave aspects of the amended claims are clearly supported by the specification and figures. Referring to FIG. 11, the mere use of a spatial light modulator (SLM) 1104 clearly establishes that the data beam is a 2D plane wave. In addition, two lenses 1106A and 1106B are used to process the data beam. As described in paragraph [0089] of the present specification, the imaging relay lens pair 1106A and 1106B are used to scale the imaging size of the input SML 1104 to match that of the input pupil of the PRC 1108. Since a pupil is utilized, it may be understood that the application is describing an aperture for accepting a plane wave reference beam and not a line laser beam.

In addition, the reference beam also passes through relay lens pair 1106C and 1106D before impinging upon the MEMS mirror. Paragraph [0090] of the present invention provides that the focal lengths and aperture size of the lens pair 1106C and 1106D is selected to compensate for the scale difference between the input SLM 1104 aperture and that of the MEMS mirror 1112. Accordingly, since the relay lens pairs are used, the beams must be plane wave reference beams – there would be no need or benefit to using such a relay lens pair if the reference beams were line laser beams.

In view of the amendments to the claims, the prior art may be examined. Firstly, Yamaji merely describes a volume holographic memory-based optical information-recording/reproducing apparatus that is capable of enhancing density of spatial multiple recording. A recording medium is mounted in the apparatus for recording a three-dimensional optical interference pattern formed by at least two coherent light beams as spatial changes in refractive index of the recording medium. A signal beam optical system supplies a coherent signal beam to the recording medium through a Fourier transform lens. (See Abstract). Of particular note is that Yamaji's architecture records the data in a Fourier transform (FT) plane. The use of such an FT plane increases the complexity of recording by requiring an additional light modulation device 60 (of FIG. 1) that will have to spatially attenuate the input reference light intensity according to the signal beam dot intensity. Since the Fourier transform of the input density can easily vary by more than 1000 between the zero order (central dot of FIG. 2A) and the higher orders (outer dots), large amount of reference beam energy will be attenuated and therefore wasted.

In addition, it may be understood that a reference beam angle can be varied such that multiple pages of data can be saved in the hologram recording. The prior art utilizes either a manually moved mirror or a galvanometer based scanning mirror. The drawback of using such mirror is that the reference beam angle can not be adjusted at high-speed. In fact, there is not even a hint or suggestion to conducting such high-speed beam steering in Yamaji.

In this regard, the Office Action admits that Yamaji fails to teach the high speed steering of the present invention. Instead, the Office Action relies on Gladney. Firstly, Applicants note that there is no suggestion in either Yamaji or Gladney to combine Yamaji with Gladney or vice versa. The combine the references, the Office Action relies on the motivation that the MEMS mirror is efficient compact and consumes low power. While such facts may be true, such information fails to provide any motivation either in the references themselves or known in the prior art to combine the teaching of Yamaji with Gladney.

In addition to the lack of the motivation to combine, Applicants submit that Gladney also fails to teach numerous aspects of the claims for which the Office Action relies on Gladney. The Office Action relies on Gladney to teach a MEMS mirror for scanning the reference (Fig. 9). Firstly, as can be clearly seen in Gladney's FIG. 9, multiple different wavelengths are used as input from a network. Such multiple wavelengths are time/bit modulated and each wavelength is input on a separate line. The use of time modulated multiple wavelengths on separate lines clearly indicates

that the laser is a bit stream line/ray and not a plane wave. To properly spread out the bit stream, Gladney utilizes two MEMS mirrors, one mirror for the reference beam and the other for the data beam. Accordingly, rather than utilizing a single MEMS mirror to steer a plane wave reference beam (as claimed), Gladney's figure clearly illustrates an architecture that utilizes multiple MEMS mirrors (including a MEMS mirror for the data beam) to spread out and scan a line laser beam. Based on the architecture illustrated in Gladney, there would be no need, possibility, or remote suggestion relating to steering a plane wave reference beam as claimed. In this regard, Gladney actually teaches away from the present invention since Gladney is directed towards using MEMS mirrors to scan and spread out a line laser and not to steer a plane wave reference beam as claimed.

In addition, since Gladney is directed towards a bit-stream modulated line/ray, it cannot be used to read or write an entire page of data as claimed. Instead, Gladney requires point-to-point precision alignment using both of the MEMS mirrors. Again, such an architecture is clearly differentiable and cannot render obvious the imaging of an entire page of data that is recorded or read at the same time as claimed.

Further, as can be seen in FIGS. 8-10, Gladney is directed towards input data from a network and not from a 2D plane wave collimated laser beam. While the Office Action relies on Yamaji to teach this element, the architecture of Yamaji and Gladney are not compatible with each other and there is no motivation to combine the two references. Further, even if they are combined, the combination would still fail to teach, disclose, or suggest the claimed architecture.

Moreover, the various elements of Applicants' claimed invention together provide operational advantages over Yamaji and Gladney. In addition, Applicants' invention solves problems not recognized by Yamaji and Gladney.

Thus, Applicants submit that independent claims 6, 16, and 26 are allowable over Yamaji and Gladney. Further, dependent claims 7-11, 17-20, and 27-31 are submitted to be allowable over Yamaji and Gladney in the same manner, because they are dependent on independent claims 6, 16, and 26, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 7-11, 17-20, and 27-31 recite additional novel elements not shown by Yamaji and Gladney.

V. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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